

Betting against Human Ingenuity: The Perils of the Economic Valuation of Nature's Services

JAKUB KRONENBERG

At the turn of the twentieth century, economic ornithologists focused on the monetary value of services provided by birds in order to fit nature conservation into the dominant economic paradigm. Pest control was of key interest because of its political importance and because it was relatively easy to quantify and monetize. However, this particular service became obsolete when a human-made solution was introduced that performed the same service—seemingly more cost effectively and reliably—undermining the political standing of economic ornithology. The broader external costs related to the replacement of birds' services by industrial pesticides were only discovered later. With their focus on the individual benefits that people derive from nature or even bundles of such benefits, the concepts of ecosystem services, the valuation of ecosystem services, and nature-based solutions expose nature conservation to similar risks, of which we may not yet be aware.

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A successful young banker decided to leave his promising career and focus on nature conservation. However, instead of abandoning his economic skills, he decided to use them to fit the discussion on conservation into the dominant economic paradigm—to talk about conservation using economic terms, focusing on services that people obtain from nature. If this story sounds similar to that of Pavan Sukhdev, study leader of the The Economics of Ecosystems and Biodiversity (TEEB) project, it is only a coincidence. In fact, it refers to a figure who lived and worked 100 years earlier: Frank Chapman (1864–1945), a curator of birds at the American Museum of Natural History.

Recurring ideas

Although Chapman was definitely not the most important figure in economic ornithology, in 1903, with a report called *The Economic Value of Birds to the State*, he made a contribution to the field by providing a systematic review of services provided by birds. “Birds are of value to the State chiefly through the services they render in (1) eating harmful insects, their eggs, and larvae; (2) in eating the seeds of noxious weeds; (3) in devouring field mice and other small mammals which injure crops; (4) in acting as scavengers,” his report states (Chapman 1903, p. 6). Chapman also refers to many other services provided by birds, including seed distribution, pleasure related to bird song and viewing, and recreation and adventure related to the use of birds as game

animals, as well as to problems (disservices), such as the fact that birds devour fruit. Indeed, the main objective of economic ornithology was to weigh birds' services and disservices and thus ascertain their economic status.

In 2007, a high-level international political meeting in Potsdam initiated the TEEB project, the aim of which is to discuss the economic consequences of biodiversity loss and thus make an economic case for nature conservation. Although the TEEB project is just one of many initiatives that focus on the economic dimension of ecosystem services, it has probably received the highest political visibility (Kumar et al. 2013). In an interim report, Sukhdev (2008) suggested that the lack of valuation of nature is “an underlying cause for the observed degradation of ecosystems and the loss of biodiversity” (p. 4).

Economic ornithology's deliberations on the economic status of birds focused on the usefulness of birds in agriculture and in particular on their pest control services, as was highlighted by Chapman. The reasons they did so were practical: Birds were threatened by a number of human activities (such as the feather trade and bounty laws encouraging people to kill birds), and agriculture was still particularly important, both economically and socially. Therefore, fitting conservation into the broadly used economic reasoning—and the relatively easy task of calculating the economic (monetary) value of birds—was seen as a political necessity.

Modern discussions on the value of nature are motivated by the same reasons: Ecosystems are threatened by a number of human activities, and it is relatively easy and highly politically relevant to highlight their usefulness (cf. Farber et al. 2002, MEA 2005), especially in the case of some services, such as carbon sequestration or water quality regulation, that have become important both economically and socially.

Economic ornithologists calculated the economic value of birds using an avoided–damage cost method. On the basis of an analysis of birds' stomach contents, they determined how much damage the birds prevented (or caused). Today, we have a much broader spectrum of valuation techniques that allow us to capture many different kinds of value, both monetary and nonmonetary (Pascual et al. 2010). However, most discussions on the value of nature still focus on the monetary dimension—again for practical reasons—and exhibit a similarly utilitarian and anthropocentric perspective on nature (Chan et al. 2007, Norgaard 2010, Spash 2011, Luck et al. 2012, Kallis et al. 2013, Raymond et al. 2013).

Although the focus here is on Chapman, who was an important figure in the bird conservation movement and embraced the ideas of economic ornithology, and although economic ornithology developed primarily in the United States—whose Department of Agriculture had a separate Division of Economic Ornithology and Mammalogy (later the Bureau of Biological Survey)—hundreds of scientists were involved in this area of research in many countries. More than 1000 publications on economic ornithology were published mostly in the relatively short period of 1880–1920. Indeed, economic ornithology experienced exponential growth (Kronenberg 2014a) similar to the recent growth in the number of publications on ecosystem (and environmental) services, which, according to the Scopus database, by the middle of 2015 numbered over 13,000 (only including peer-reviewed academic publications).

Such rapid growth may be a symptom of a growing bubble (as in the case of the dot-com bubble or the more recent housing bubble in the United States). A bubble grows when more and more people (e.g., investors or researchers) join, following a herd instinct rather than thoughtful individual consideration of what is at stake. Individually, all of them may be well intentioned, either expecting private gains (rational economic agents?) or broader conservation goals (to be achieved by using seemingly convincing arguments, such as the economic benefits provided by nature). However, bubbles tend to burst. And that is what happened in the case of economic ornithology.

A bubble bursts

McCauley (2006) has suggested that with the concept of ecosystem services, we are “betting against human ingenuity” and that “the entire history of technology and human ‘progress’ is one of producing artificial substitutes for what we once obtained from nature, or domesticating once-natural services” (p. 28). Meanwhile, proponents of the ecosystem-services framework (and of valuing ecosystem services

in monetary terms) object to McCauley and suggest that highlighting the economic importance of selected ecosystem services implies that restoring or recreating ecosystems for these services “is only using our intelligence and ingenuity, not betting against it” (Costanza et al. 2014, p. 154). They argue that ecosystem services tend to solve our problems more efficiently than hard engineering solutions, which is also reflected in the increasing popularity of the so-called nature-based solutions.

However, the few oft-quoted examples, such as the Catskill Mountains water filtration arrangement for New York City, provide relatively poor and shaky evidence of the broader hypothesis that it *pays* to protect nature because of ecosystem services (Sagoff 2002). Whenever we highlight the economic value of ecosystem services, either singular or provided in bundles, we set in motion an economic and technological chase for substitute solutions. Will it pay to protect a given ecosystem for the services it delivers if a human-made alternative becomes available? Note that such an alternative may become more cost effective not only because of human ingenuity but also because of a change in a broader economic setting (e.g., if it affects the profitability of a previous use of a given ecosystem). As was already indicated by Krutilla (1967), technological progress asymmetrically enhances the capacity of human-made capital to deliver goods and services, compared with a virtually inelastic supply of ecosystem services. Indeed, it is emphasizing the limits of substitution between natural and human-made capital that differentiates ecological economics from more traditional economic approaches to studying economy–environment interactions (Gómez-Baggethun et al. 2010).

The historical case of economic ornithology offers an excellent example of how risky it is to overemphasize the narrowly understood ecosystem services as a pragmatic argument for conservation. Birds were metaphorically called “a swiftly moving body of police, adapted to sweep rapidly over the surface of the earth and assemble quickly in hosts wherever most needed to combat abnormal outbreaks or irruptions of animal life” (Forbush 1922, p. 7). Some economic ornithologists were “convinced that the birds are a most potent factor in making crop production possible, that without them we should be overrun with pests—vertebrate and invertebrate—to an extent of which we now have no conception” (Weed and Dearborn 1916, p. 4). Although counterarguments were sometimes raised—for example, that bird populations would not be able to eliminate pests or weeds because that might undermine their own existence (Taylor 1913)—it was not until the rise of industrial pesticides in the 1930s that the above fallacies were refuted. The pest-control services of birds were replaced with the services of human-made capital that proved cheaper and, above all, far more effective and efficient at providing such services. Although other problems also contributed to the demise of economic ornithology (Kronenberg 2014a), the substitution of birds' pest-control services by pesticides was its ultimate cause.

Thoughtful consideration of what is at stake

Sukhdev (2011) suggested that the value of nature can be discussed at three levels: recognizing, demonstrating, and capturing. *Recognizing value* is the most general level of realizing that nature is of value “to create a policy response favoring conservation or sustainable use.” This approach resembles the way in which economic ornithologists dealt with services other than pest control, recognition that hardly anyone now remembers. *Demonstrating value* is resorted to occasionally and refers to performing valuation studies for the sake of influencing behavior or decisions in particular circumstances. It is supposed to prevent “damaging trade-offs based on implicit valuations that are involved in causing the loss of biodiversity and degradation of ecosystems.” This was the cornerstone of economic ornithology, used to condemn the wholesale destruction of birds, which had partly been condoned on an implicit perception of birds as agricultural pests. Finally, *capturing value* involves using value estimates to create or reform economic incentives or markets, in which “the valuation of services rewarded is an important input for an effective policy solution which is backed by sound economics.” Because many ecosystem services bear the features of public goods, sound economics indicates that tradability is not always possible. However, there is large scope for improving the institutional setting within which we make decisions regarding economy–environment interactions, based not only on specific value estimates but also on the recognition of the broader value of nature. This stage was only partly reached within economic ornithology when the relevant laws were improved to protect birds (e.g., by removing economic incentives to kill birds within the bounty laws).

In the case of economic ornithology, recognizing the value of the birds and their services was overshadowed by demonstrating value, and, to a lesser extent, by capturing value. However, demonstrating that pest control was an economically valid argument for bird conservation failed. Losing the argument that birds provide important services put the protection of birds at risk because people apparently no longer needed them (at least not for the previously most highlighted economic reasons). It only emerged later that pesticides brought severe risks to the “farmers’ feathered friends,” many of which arrived at sprayed fields to feed on insect pests (Mineau and Whiteside 2013). Indeed, many human-made solutions affect the environment through a similar mechanism: replacing certain ecosystem goods or services and affecting the environment through externalities, which tend to be discovered once a substitute solution becomes widely available (such as killing birds and affecting human and ecosystem health in the case of pesticides).

Still, the example of economic ornithology does show that it pays to protect nature. However, the takeaway should not be that we rely on ecosystem goods and services and that in many circumstances, natural processes provide economically viable substitutes for human-made goods and

services; rather, we should perceive the environment more holistically. In the end, we do not depend on individual services (a perspective that drastically narrows down the “functional equivalence” of an ecosystem service under consideration (Spangenberg and Settele 2010) nor even on bundles of services but rather on the environment as a whole. Instead of trying to move from recognizing value to demonstrating value and only then to capturing it, we might rather skip the stage of demonstrating value, thereby avoiding any recourse to monetary valuation (which dominated discussions within economic ornithology). Moving directly from recognizing value to capturing value would allow us to set political priorities on a more general, holistic level rather than dividing nature into abstract services, which is required by the stage of demonstrating value (Chan et al. 2007, Norgaard 2010, Luck et al. 2012). In particular, not having to follow the monetary dimension of ecosystem services, we could avoid the impression that capturing value has to take the form of establishing markets (Gómez-Baggethun and Ruiz-Pérez 2011) and that ecosystem services could succumb to competition from other means of satisfying the same needs (Spangenberg and Settele 2010).

Meanwhile, related discussions on nature dominated by economic thinking require that the different goods and services be relatively narrowly defined for the sake of including them in economic calculations. Framing birdwatching, another ecosystem service related to birds, as a desirable contribution to economic development provides an example. Although birdwatching originated as an inherently non-consumptive behavior as opposed to other consumptive uses of birds, over time, it became part of a market with its own environmental impacts, which tend to be neglected (such as flushing birds and the increased consumption of goods and services with their own life-cycle impacts; Kronenberg 2014b). Many other ecosystem services have followed a similar path, especially as a result of making them part of the market, for which many proponents of the concept of ecosystem services have advocated—either on the basis of valuation results or on the basis of more general ideas about capturing their value.

Conclusions

Economic ornithologists bet against human ingenuity and lost. The economic ornithology bubble burst because economic ornithologists were not considering what it was that they put at stake when providing economic calculations of birds’ services to agriculture. Birds continued to be protected thanks to other less utilitarian arguments for bird conservation that evolved in the meantime, including prominent inputs from Chapman, eventually best known as an initiator of the Audubon Christmas Bird Count and as a pioneering author of bird guides. We need more people to turn from banking to nature conservation, and—following the example of Chapman—we need them to do it more decidedly than in the case of Sukhdev.

Given the limitations of our knowledge and institutions, neither our theories nor practices can properly acknowledge externalities. In consequence, the reductionism inherent in valuation exposes ecosystem services and the so-called nature-based solutions to unfair competition from human-made substitutes. In theory, one could imagine a decision-making process based on full information and taking into account all externalities. In such a situation, we might expect economic ornithology to prosper and perhaps even indicate that birds outcompete pesticides. In practice, decisions are based on much narrower criteria, and valuation results are often interpreted without the proper acknowledgement of the limitations of the relevant valuation techniques and of the complex setting within which valuation studies are undertaken (including alternative solutions and the related externalities). The historical case of economic ornithology well illustrates such an economic hubris, which we may understand as a failure to consider the broader setting within which economic calculations and decisions are made. Therefore, it is necessary that a much broader acknowledgement of our complex dependence on nature and its nonsubstitutability be reflected in the relevant political and ethical priorities.

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Jakub Kronenberg (kronenbe@uni.lodz.pl) is affiliated with the Department of International Economics at the University of Lodz, in Poland.